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DECLARATION

The undersigned, Dana Scruggs, having an office at 8902B Otis Avenue, Suite 204B, Indianapolis, Indiana 46216, hereby states that she is well acquainted with both the English and German languages and that the attached is a true translation to the best of her knowledge and ability of PCT/EP 03/09908 (INV.: GROSCHUP, H.., ET AL), entitled "Construction System for Erecting Buildings".

The undersigned further declares that the above statement is true; and further, that this statement was made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or document or any patent resulting therefrom.

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CONSTRUCTION SYSTEM FOR ERECTING BUILDINGS

Description

The present invention relates to a construction system for erecting buildings with walls configured from panel-type elements.

In buildings with a pillar framework as the supporting construction, the intermediate spaces between the pillars are often infilled with panel-type elements. These panel-type elements are provided with appropriate insulating materials to ensure good insulation, but they always form through joints with the pillars that act as cold bridges, in particular when the mortar that joins the pillars and the panels cracks due to temperature influences.

To prevent this problem, a construction system is proposed in EP 0 838 557 A2, in the case of which a wood supporting construction is infilled with shaped blocks, and the wood pillars are covered—toward the outside, at least—by parts of the adjacent shaped blocks. This eliminates through joints between the shaped blocks and the pillars. The proposed construction system is therefore insensitive to temperature influences that could cause the mortar between the pillars and shaped blocks to crack. This known construction system—which also enables the use of shaped blocks manufactured primarily out of renewable raw materials such as wood chips—is also very well suited for use as a do-it-yourself construction system, since, once the supporting construction is erected, the only remaining step is to infill the intermediate spaces with the shaped blocks. The known construction system is not suited to prefabrication on an industrial scale, however.

The present invention is therefore based on the task of proposing a construction system that allows industrial-scale prefabrication of wall elements with no cold

bridges and that are composed of a material that is ecologically unobjectionable and permeable to diffusion.

The task is achieved, according to the present invention, using a construction system for erecting buildings with walls configured from panel-type elements by fabricating the panel-type elements out of a material that contains crushed vegetable-fiber material, in particular wood chips, and includes recesses for accommodating pillars of a supporting construction. Until now, the large amount of material lost in the manufacturing process permitted only sheathing or complete blocks to be manufactured from vegetable-fiber materials. Surprisingly, it has since been demonstrated that very large panels and modules can be manufactured as well. As a result of the recesses provided in the panel-type elements capable of being prefabricated on an industrial scale, all joints between the panel-type elements and the pillars that are open from the outside of the wall to the inside of the wall are eliminated. If the wall is composed of multiple panel-type elements, the edges of adjacent panel-type elements can be indented with each other, so that no straight, through joints between the outside and the inside of the building are produced here, either. By manufacturing the panel-type elements out of a material that contains primarily crushed vegetable-fiber material, an ecologically unobjectionable construction system made of ecologically renewable raw materials is obtained. In addition, the panel-type elements are fully recyclable. The wall construction can be designed to be entirely permeable to diffusion, thereby ensuring a healthy living environment. The material that is already known for manufacturing shaped blocks also has an extremely low coefficient of thermal conductivity, thereby allowing energy-efficient buildings to be built using only the material, without the use of additional insulation materials. If pillars made of wood, in particular glued laminated wood, are used in addition, and if the panel-type elements are made largely of wood chips, then a wall system is obtained that is made of a uniform material, namely wood.

The recesses can be formed in one or both surfaces of the panel-type elements. If recesses for pillars are provided in both sides, they can be arranged in an alternating pattern. This allows pillars to be placed in a relatively dense pattern, if desired, without the need to consume an unnecessarily large amount of expensive wood to create pillars that are too thick.

Particular advantages result when the walls are covered with cover panels on the surfaces provided with recesses for the pillars, the cover panels being made of the same or a different material than the panel-type elements. Seamless, smooth surfaces are then obtained on the outsides of the panel-type elements, which can then be easily processed further, e.g., by applying a plaster carrier. The cover panels can be configured with a thickness that is equal to the distance between the base of the recesses and the surface of the panel-type elements and the surface of the panel-type elements that is diametrically opposed to the recesses. With a configuration of this type, the pillars will be located in the center of the walls. This provides advantages in terms of stability and erecting the walls.

Another possibility for obtaining internal pillars and surfaces that are smooth on the outside is to form the walls out of panel-type elements that are diametrically opposed in pairs, whereby the recesses in the panel-type elements for the pillars are diametrically opposed and form a single cavity. This type of wall configuration has the advantage that, except for the panel-type elements, no additional elements such as thinner cover panels need be manufactured.

With a wall design using cover panels and panel-type elements that are diametrically opposed in pairs, the wall thickness and thermal conductivity can be influenced by providing an air gap between the cover panels and the panel-type elements and/or between the two panel-type elements.

With this wall design, which is suited for exterior and interior walls, any type of further processing of the surface is possible. With a preferred embodiment, the walls can be provided with plaster or gypsum panels on one or both sides.

The pillar framework can be composed, preferably, of wood. Other types of materials can also be used for this purpose. To erect tall buildings, in particular, the pillars can be manufactured out of concrete, steel or a composite material.

To enable prefabricated houses to be erected in an economical manner using the construction system according to the present invention, it is advantageous when the walls are composed of prefabricated wall elements or are capable of being assembled out of the same. For this purpose, the wall elements can include panel-type elements, pillars, a threshold and a top framework. The wall elements can also be provided with cover panels made of the same or a different material as the panel-type elements, so that they have a smooth surface on both sides. When the same material is used for the cover panels as for the panel-type elements, they can have the same or a different thickness. As a result, the thermal conductivity can be influenced in a desired manner. With an even higher degree of prefabrication, the wall elements can be provided with plaster or gypsum panels or a plaster system on one or both sides.

The method according to the present invention for manufacturing prefabricated wall elements for a construction system according to the present invention is characterized by the fact that pillars are inserted into and secured in recesses in the panel-type elements provided for this purpose, and a top framework and a threshold are secured to the top and bottom edges of the panel-type elements. The panel-type elements can be shaped panels with recesses already formed therein. Another possibility is to form the recesses for the pillars in solid panels manufactured using crushed vegetable-fiber material, by milling them out, for example. This is an advantage, in particular, with materials that undergo considerable shrinkage during fabrication, since the required dimensional

accuracy of the recesses is very difficult to realize in the shaping process. Installation channels for accommodating water lines and electrical wiring can also be created during manufacture of the panel-type elements.

To manufacture wall elements with which the pillars are covered toward the outside, cover panels made of the same or a different material than the panel-type elements and/or gypsum or plaster panels are placed on the surface of the panel-type elements that include the recesses and are secured to the pillars, at the least, by nailing and/or bonding, for example.

To manufacture wall elements with panel-type elements that are diametrically opposed in pairs, pillars that extend beyond the surface of the panel-type elements are inserted into the recesses, then the second panel-type element with recesses is installed in such a manner that the pillars are accommodated by the recesses in the second panel-type element. In this process, as in the process of installing cover panels on the panel-type element, an air gap can be formed between the two panel-type elements and/or between the panel-type element and the cover panels. This is accomplished in the simplest manner possible by inserting pillars having a depth that ensures formation of the desired air gap.

The wall elements can be fabricated preferably in a horizontal position. After the cover panels, gypsum or plaster panels or the second panel-type elements are installed on the first panel-type element—into which the pillars have already been inserted—these installed elements can be nailed to the pillars, and the top framework and threshold can be installed and nailed together with the pillars and the panel-type elements before the wall element is turned and the first panel-type element is nailed together with the pillars from the outside. This results in a completely prefabricated wall element obtained in an economical manner with relatively few working steps.

The panel-type elements and the cover panels can be fabricated in appropriate shapes. It is also possible to assemble them out of shaped blocks as prefabricated elements, however.

When the pillars are manufactured out of concrete, the recesses can be lined and then filled with concrete. It is also possible to pre-install a reinforcement for the pillars. To further increase the degree of prefabrication of the wall elements, panels made of drywall material or plaster systems can be installed on one or both sides of the wall elements.

Preferred exemplary embodiments of walls and manufacturing procedures for a construction system according to the present invention are described below in greater detail with reference to the drawing.

Figure 1	shows a cross section through a first wall according to the present invention;
Figure 2	shows a cross section through a second wall according to the present invention;
Figure 3	shows a cross section through a third wall according to the present invention;
Figure 4	shows a cross section through a fourth wall according to the present invention;
Figures 5a - 5e	show a schematic representation of the manufacture of the wall in Figure 2 as a prefabricated wall element;
Figures 6a – 6c	show a top view, a side view, and a sectional view through a wall element manufactured according to the method in

Figure 5, before the cover panel is installed;

Figures 7a, 7b show partial cross sections through panel-type elements with pillars connected with the elements in a form-locked manner.

Wall 10 according to Figure 1, which can be an exterior wall of a building, in particular, is composed of a panel-type element 11 that is manufactured out of a material that contains primarily vegetable-fiber materials. Panel-type element 11 can be composed of wood concrete, for example, that is, a mixture of wood chips and cement. It is also possible to use hemp shives, bamboo, coconut shells and the like. Panel-type element 11 includes recesses 12 for accommodating pillars 13. Recesses 12 can be installed preferably in the inward-pointing surface of panel-type element 11. If pillars 13 are composed of wood, they are well protected against the effects of weather. A plaster layer, which is not shown here, can be installed on the exterior of wall 10, and plaster or gypsum panels can be installed on the interior, so that the wall can then be finished with the final plaster application and/or be painted.

Wall 20 shown in Figure 2 also includes a panel-type element 21, which is thinner than panel-type element 11 in Figure 1, but otherwise has the same design. Recesses 22 for accommodating pillars 23 are also provided on one of the outer surfaces of the panel-type element 21. In this case, however, pillars 23 are covered by a cover panel element 24 placed in front of said pillars. In contrast to wall 10, wall 20 has a seamless, smooth surface on both sides, which can be processed further immediately and directly. With wall 20, the thickness of cover panel 24 is exactly equal to the distance between the bottom of recesses 22 and diametrically opposed side 21.1 of panel-type element 21. As a result, pillars 23 are located exactly in the center of wall 20. The wall does not necessarily have to have this design, however.

Figure 3 shows another alternative of a wall design 30 that includes smooth, seamless surfaces on both sides. In this case, two panel-type elements 31, 31' are positioned such that they are diametrically opposed in pairs. Both panel-type elements 31, 31' are provides with recesses 32, 32'. If panel-type elements 31, 31' are placed next to each other, recesses 32, 32' form one cavity for accommodating a pillar 33, in particular a pillar manufactured out of glued laminated wood. Pillars 33 are drawn larger in Figure 3 than pillars 13, 23 of walls 10, 20 in Figures 1 and 2. This thicker configuration makes it possible to provide larger distances between pillars 33 than between pillars 13 or 23. Pillars 33 could also have the same cross section as pillars 13 and 23. Recesses 32, 32' of panel-type elements 31, 31' could then be configured smaller in size. The dimensions of pillars 33 and recesses 32, 32' can also be matched to each other such that an air gap 34 is formed between the two panel-type elements 31, 31', which has a positive effect on the insulating properties of wall 30. An air gap of this type could also be created in the same manner in wall 20 in Figure 2 between panel-type element 21 and cover panel 24. Compared with wall 20, wall 30 has the advantage that it is built of uniform elements 31, 31'. With wall 20, on the other hand, two different elements—panel-type element 21 and cover panel 24—must be provided. On the other hand, with cover panel 24 of wall 20, there is no need to create recesses for pillars 23.

While walls 10, 20, 30 are usable primarily as exterior walls, wall design 40 shown in Figure 4 is suited primarily for interior walls. In this case, panel-type element 41 is provided with recesses 42 for pillars 43 on both sides. Recesses 42 are located on one of the two sides in an alternating pattern. As a result, it is possible to place relatively thin pillars 43 relatively close together, allowing gypsum or plaster panels 44 with relatively narrow dimensions to secured in front of pillars 43.

Figure 5 shows a possibility for manufacturing wall 20 shown in Figure 2 as a prefabricated wall element. Wall element 30 in Figure 3 could also be

manufactured in an entirely similar manner, if a second panel-type element 31' were installed instead of cover panel 24. Figure 5a shows a solid panel 50 made of a material composed primarily of vegetable-fiber material. When recesses 22 are created in this panel 50, panel-type element 21 is created. To do this, panel 50 clamped to a machining bench 51, which is indicated in Figure 5 in a non-detailed manner. The machining can then be carried out using a milling tool, for example. Window openings can also be sawed into panel 50. The waste material is fully recyclable.

After recesses 22, and recesses (not shown) for a top framework and a threshold are formed, pillars 23 are inserted in recesses 22, and the top framework and the threshold are inserted in the recesses provided therefor, then clamped and nailed to pillars 23. A cover panel 24 is then placed on panel-type element 21 and secured to the top framework and the threshold by nailing 52 and/or bonding. The entire arrangement is then turned 180°, so that cover panel 24 rests on machining bench 51. Panel-type element 21 can now be joined with pillars 23, also with nails 52.

Cover panel 24 can be composed of the same material as panel 50. Another material could also be used for this, such as a material with lower thermal conductivity.

Figures 6a through 6e show a wall element 60 fabricated according to the method in Figure 5 in the fabrication stage before the cover panels are installed. Wall element 60 includes a door opening, which, similar to the recesses for pillars 63, top framework 64 and threshold 65, can also be formed in a solid panel to manufacture panel-type element 61. A lintel 67—for which a recess is also formed in panel-type element 61—is located above door opening 66. The embedded position of top framework 64 and threshold 65 in the material of panel-type element 61 is illustrated in the cross-sectional view in Figure 6c in

particular. Top framework 64 and threshold 65 are clamped and nailed to pillars 63.

Figures 7a and 7b show two examples of pillar cross-sections that permit a form-locked connection between pillars 71 and 72 and panel-type element 70. Pillar 71 in Figure 7a includes a trapezoidal cross section, and pillar 72 in Figure 7b has an "I"-shaped cross section.